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IS 11838 (1986): Recommendations for measurement of quality characteristics of gudgeon pins [TED 2: Automotive Primemovers]

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UDC 621·43-242·43 : 658·562 (First Reprint NOVEMBER 1998) IS : 11838 - 1986
(Reaffirmed 1996)

REAFFIRMED

Indian Standard

RECOMMENDATIONS FOR MEASUREMENT OF QUALITY CHARACTERISTICS OF GUDGEON PINS

Internal Combustion Engines Sectional Committee, EDC 14; Piston Assembly Components Subcommittee, EDC 14 : 1 [Ref : Doc : EDC 14 (3360)]

1. Scope — Covers recommended practices for dimensional measurements of gudgeon pins applicable to internal combustion engines according to IS : 6740-1985 'Specification for gudgeon pins for internal combustion engines (*first revision*)'.

2. Nomenclature — Nomenclatures for various parameters shall be according to IS : 6740-1985.

3. Quality Characteristics and Recommended Measuring System — Each characteristic shall be defined and the method of test then recommended.

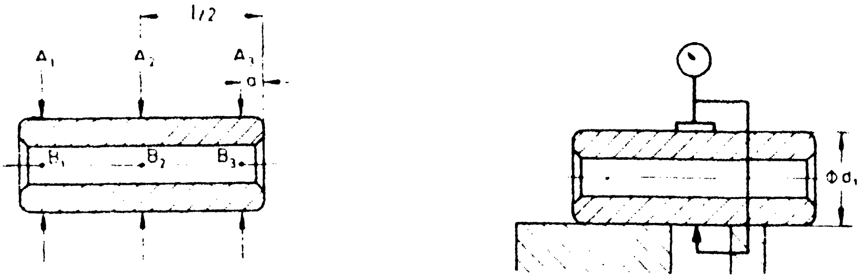
3.1 *Gudgeon Pin Outer Diameter (d_1)*

3.1.1 The outer diameter d_1 shall be measured after soaking at a steady state temperature of 20°C for at least two hours.

3.1.2 Average of six diameter measurements, three each in mutually perpendicular planes shall be taken (*see* Fig. 1).

For special requirements, the diameter may also be defined as the highest or lowest value out of the six measurements, as may be agreed to between the manufacturer and the purchaser.

3.1.3 Gudgeon pin diameter may be checked by a suitable arrangement, with a mechanical comparator having a ruby point and with a least count of 0·5 micron. It is mounted in such a way as to enable diameter measurements checked at three points along its length; rotated through 90° and again checked at three points as shown in Fig. 1.



$a = 0·15\ d_1$ up to 50 mm
$a = 0·10\ d_1$ over 50 mm

FIG. 1 MEASUREMENT OF GUDGEON PIN OUTER DIAMETER

3.1.4 The outside diameter of the gudgeon pin may also be measured by an air gauge having a dial display or with liquid column against a graduated scale. With three point measurements 'lobing' can also be detected.

3.2 Deviations From Geometrically Cylindrical Surface

3.2.1 *Ovality* — is the difference between the maximum and minimum outer diameter in any one plane perpendicular to the gudgeon pin axis, that is, $A \sim B$ (Fig. 2).

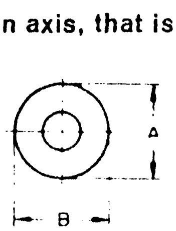


FIG. 2 OVALITY

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3.2.2 *Concavity* — When diameter measurements along the gudgeon pin length over the same cylindrical surface generating line indicate that central zone is smaller in diameter than end zones on either sides, the gudgeon pin is said to be concave and the amount of concavity is determined by difference between maximum and minimum diameter (Fig. 3).

$A1 \quad (A3) \quad > \quad A2 \quad \text{or} \quad B1 \quad (B3) \quad > \quad B2$

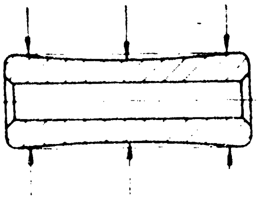

FIG. 3 CONCAVITY

3.2.3 *Convexity* — If diameter measurements given in **3.2.2** indicate central zone diameter bigger than end zones, pin is said to be convex (Fig. 4).

$A1 \quad (A3) \quad < \quad A2 \quad \text{or} \quad B1 \quad (B3) \quad < \quad B2$

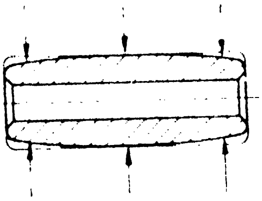

FIG. 4 CONVEXITY

3.2.4 *Cylindricity* — If the diameter measurements given in **3.2.3** indicate that one end zone is bigger in diameter than the other end, the change in diameter from one end to the other being spread over the entire length of the pin, the pin is said to be conical. $A1 > A2 > A3$ or vice versa (Fig. 5).

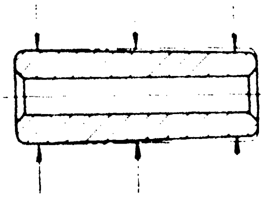

FIG. 5 CYLINDRICITY

3.2.5 *Waviness* — If the diameter measurements follow a random pattern of increase and decrease along the pin length, while being measured by a surface trace the phenomenon is called waviness (Fig. 6).

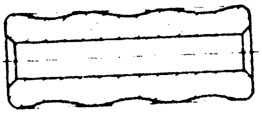

FIG. 6 WAVINESS

Note — The deviations from the geometric cylindrical surfaces given in **3.2.1** to **3.2.5** may also be tested by a form tester.

3.3 *Gudgeon Pin Bore Diameter (d_2)* — Measurement of gudgeon pin bore diameter (d_2) is required in case of hollow gudgeon pins. Checking is done with the help of 'GO' and 'NO GO' plug gauges which may be suitably designed (Fig. 7).

AMENDMENT NO. 1 OCTOBER 2008
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IS 11838 : 1986 RECOMMENDATIONS FOR MEASUREMENT OF QUALITY CHARACTERISTICS OF GUDGEON PINS

(*Page* 1, *clause* 3.1.1) — Substitute the following for the existing:

'**3.1.1** The outer diameter d_1 shall be measured after soaking the gudgeon pin at 20 ± 1°C until it reaches the temperature.'

(*Page* 1, *clause* 3.1.3, *first sentence*) — Substitute the following for the existing:

'**3.1.3** Gudgeon pin diameter may be checked by a suitable arrangement, with a mechanical comparator having a ruby point or Precision Measuring Microscope of least count 0.5 µm/1 µm (0.5 µm is more accurate).'

(*Page* 4, *clause* 3.9) — Substitute the following for the existing:

'**3.9** *Surface Roughness of Outer Diameter and Inner Diameter and Side Faces* — Shall be tested according to IS 3073 : 1967 'Assessment of surface roughness' with roughness checking stylus instrument. At least three readings to be measured along lengthwise on the circumference for assessment.'

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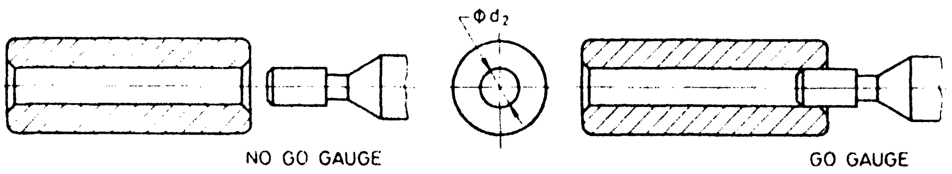

FIG. 7 **CHECKING OF GUDGEON PIN BORE DIAMETER**

3.4 *Gudgeon Pin Length (l)*

3.4.1 The minimum distance between two planes perpendicular to gudgeon pin axis through which the gudgeon pin can be passed keeping the pin perpendicular to both the planes.

3.4.2 The length shall be measured by placing gudgeon pin on a 'V' block and a suitable measuring instrument. One end of the pin rests against on accurate flat plate at right angles to the 'V' block. A mechanical comparator with least count of 0·01 mm is mounted on a stand and suitably adjusted to check the pin length (Fig. 8).

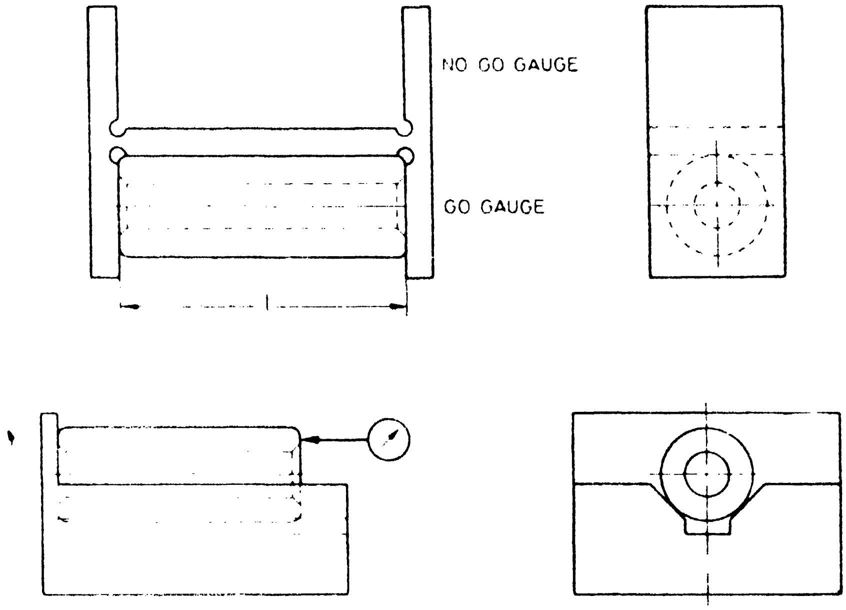

FIG. 8 GUDGEON PIN LENGTH

3.4.3 The length may also be checked by a ' GO ' and ' NO GO ' gauge.

3.5 *Gudgeon Pin Wall Thickness*

3.5.1 Thickness of wall in case of hollow gudgeon pin is measured radially.

3.5.2 For measuring wall thickness variations, the gudgeon pin shall be placed on a 'V' block. A mechanical comparator having least count of 0·01 mm is made to contact with the bore of gudgeon pin through a lever arrangement and the gudgeon pin shall then be rotated to check the wall thickness differences from either end (Fig. 9).

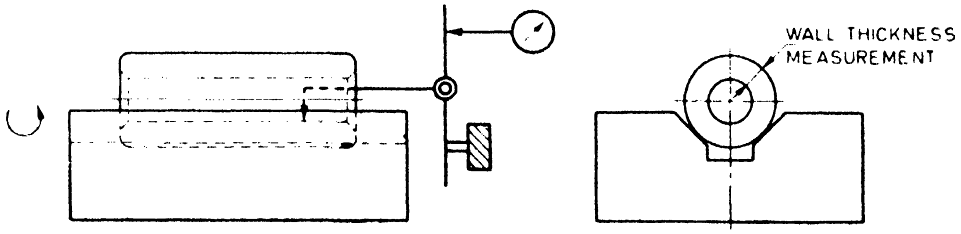

FIG. 9 **WALL THICKNESS MEASUREMENT**

3.6 *Squareness of End Faces*

3.6.1 Geometrical squareness between pin end faces and pin axis (determined by pin outer surface).

3.6.2 Squareness of end faces shall be measured by locating gudgeon pin on a 'V' block against a fixed point. A mechanical comparator having least count of 0·01 mm is made to contact the same face which rests against the stopper. Pin is rotated in 'V' block while retaining contact with the fixed point to give the out of squareness of the face. The same shall be repeated for the other face as shown in Fig. 10.

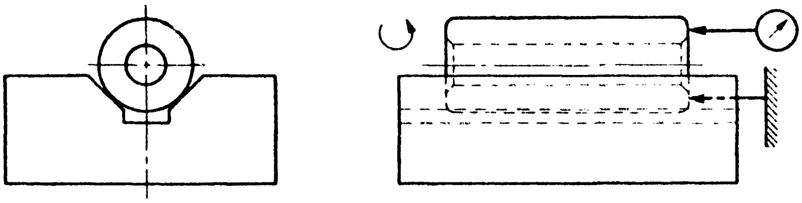

FIG. 10 SQUARENESS OF END FACES

3.7 *Bore Chamfer*

3.7.1 Width of flat land at 45° to pin axis at both ends on the bore diameter d_2.

3.7.2 Bore chamfer shall be measured with graduated magnifying lens (8 × or 10 ×) having least count of 0·1 mm.

3.8 *Corner Radii or Chamfer*

3.8.1 Radii or chamfer shall be measured with a radius gauge or profile projector (Fig. 11).

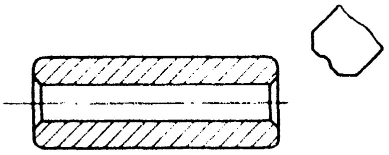

FIG. 11 CORNER RADII

3.9 *Surface Roughness of Outer Diameter and Inner Diameter and Side Faces* — Shall be tested according to IS : 3073-1967 'Assessment of surface roughness'.

4. Heat Treatment Parameters

4.1 The heat treatment parameters such as hardness of surface, core hardness and case depth shall be in accordance with IS : 6740-1985.

EXPLANATORY NOTE

This Indian Standard mentions functionally important characteristics of gudgeon pins and also the corresponding principles of measurement. The systems outlined in this standard are aimed at measuring the parameters detailed in IS : 6740-1985 'Specification for gudgeon pins for internal combustion engines (*first revision*)'.

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